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(54) Domestic fireplace

(57) In order to enhance thermal transfer between burning fuel and combustion products, particularly when the fire is banked low, e.g. in warm weather, water circulates through cavity walls 10 flanking and backing the fire box 15, through chimney insert 16, and through hollowgrate bars 19.

Additionally, the cavity walls 10 and chimney insert 16 may be of uniform width and the flue 17 may be split into two diverging passages (17*a*, 17*b*).

The grate bars may alternatively extend from front to rear or may radiate from a zone at the front to the rear and sides of the grate.

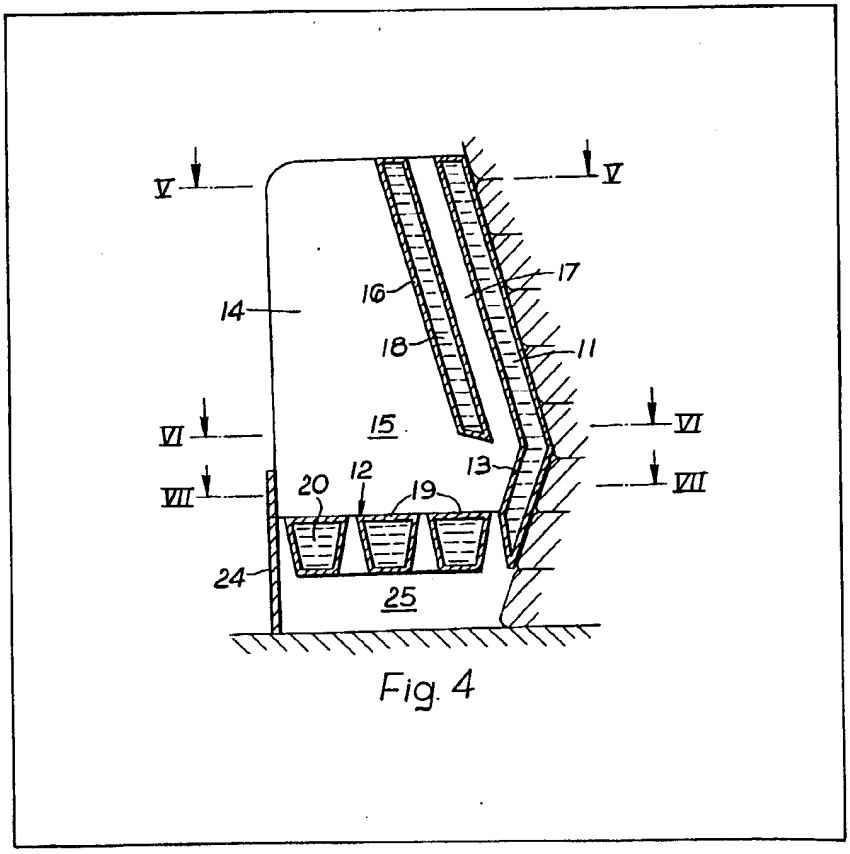

Fig. 4

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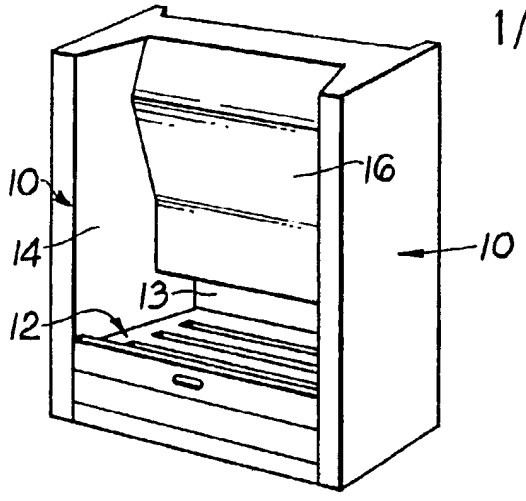

Fig. 1

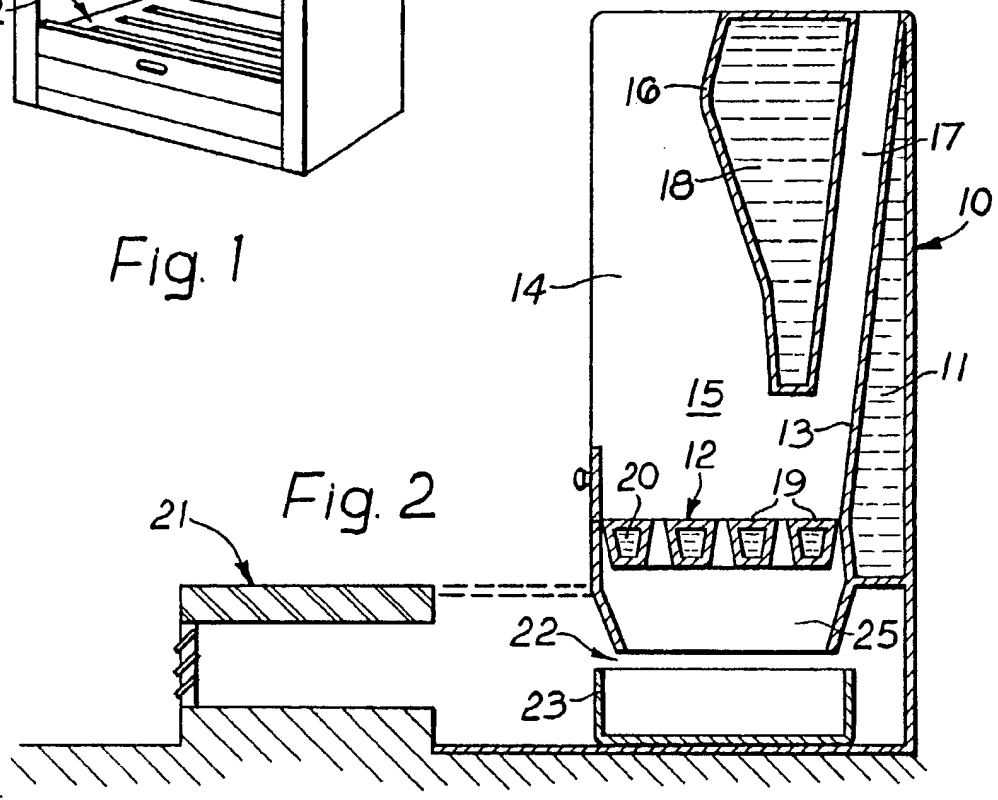

Fig. 2

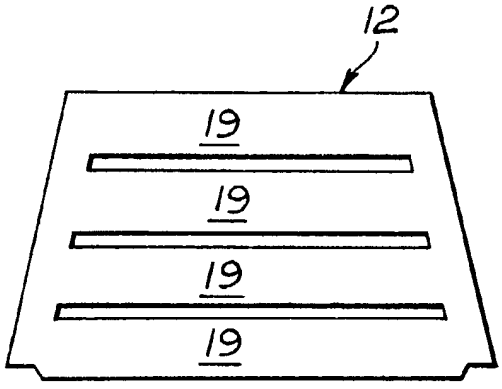

Fig. 3

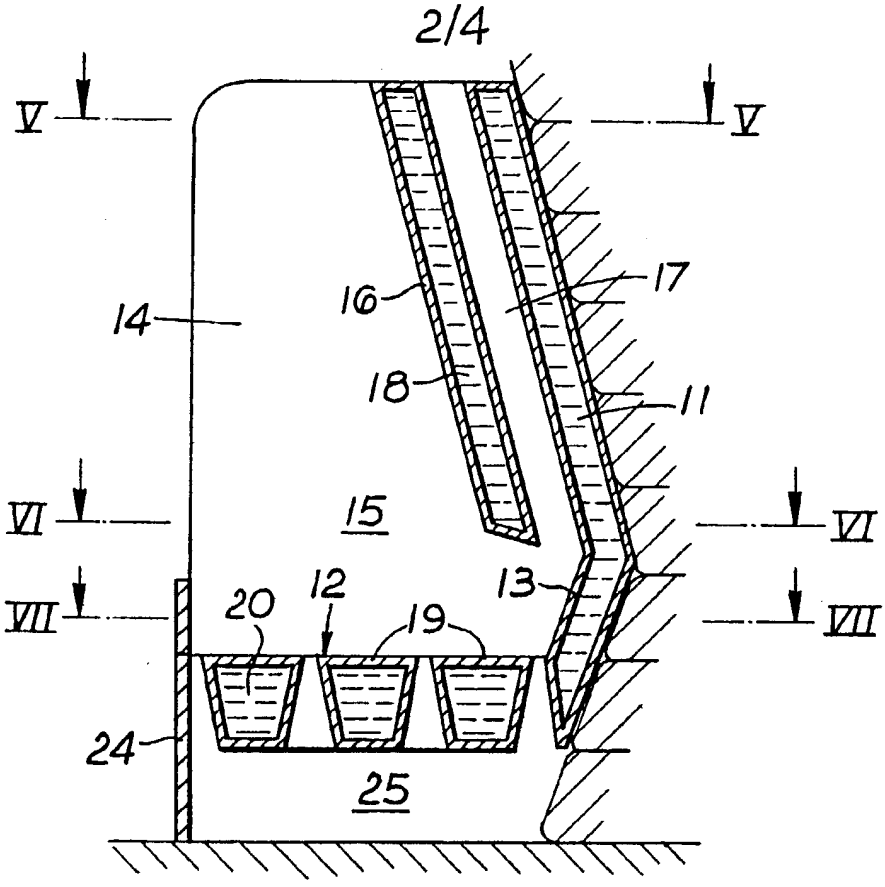

Fig. 4

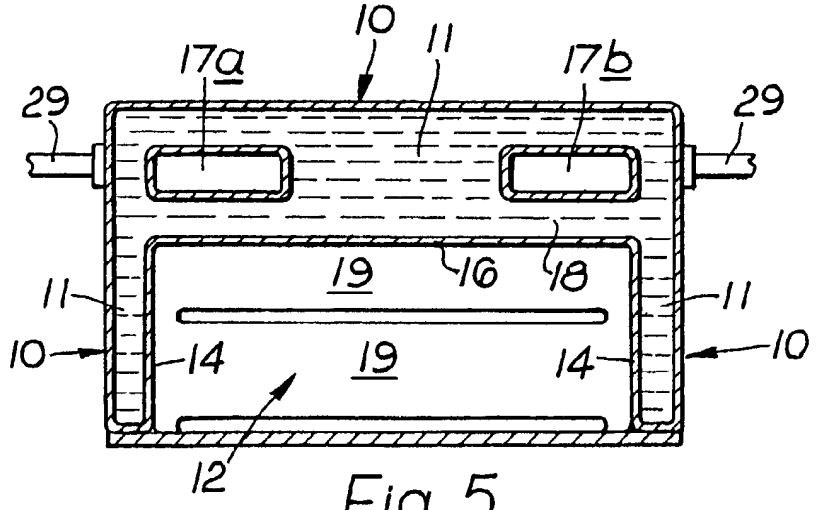

Fig. 5

Fig 4

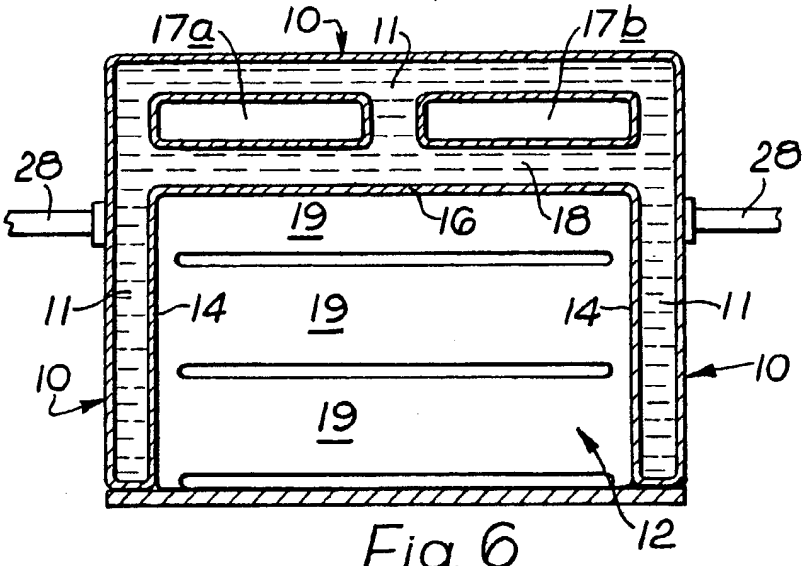

Fig. 6

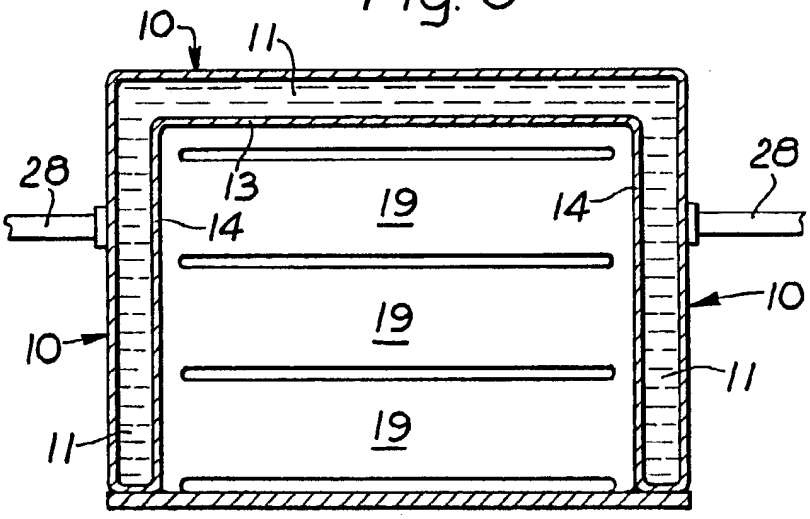

Fig. 7

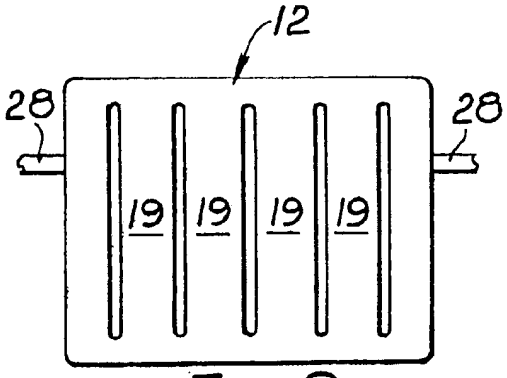

Fig. 8

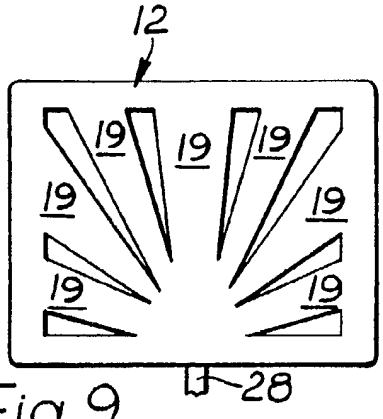

Fig. 9

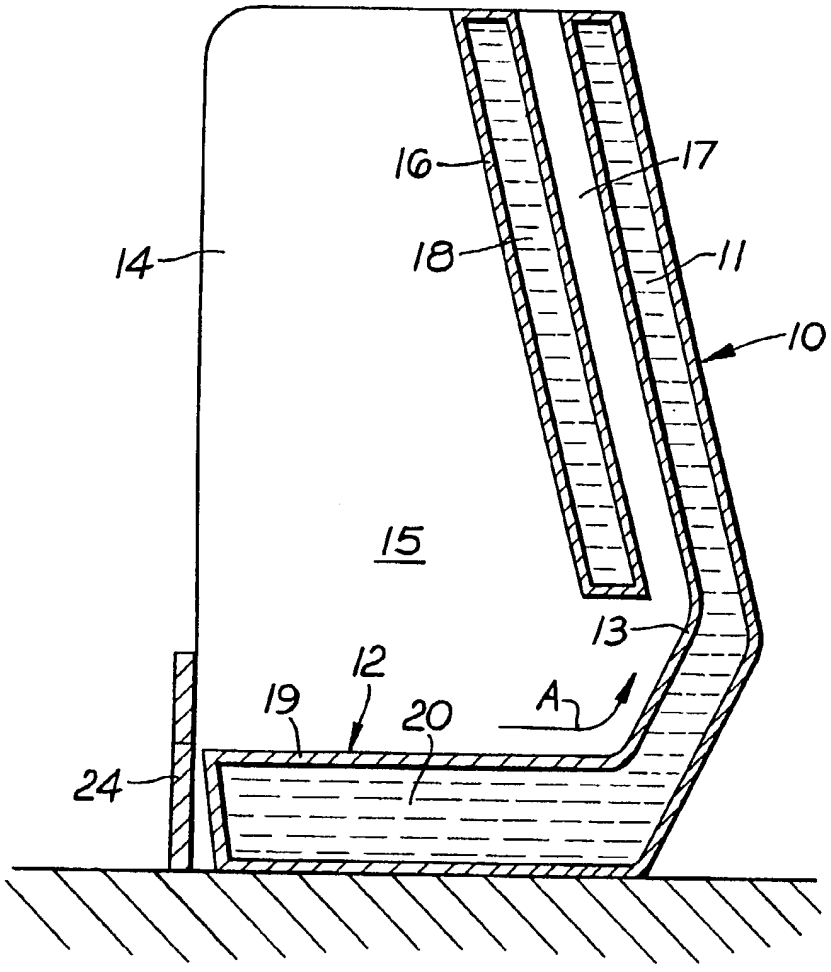

Fig. 10

SPECIFICATION

Domestic fireplace

This invention relates to a domestic fireplace incorporating a boiler for heating water.

Fireplaces which incorporate a boiler or water reservoir at the rear and/or sides of a grate are known. The water is heated while solid fuel in the grate burns by direct contact of the fuel with the walls of the boiler and/or by induced draughts carrying combustion products into contact with said walls. Often, a heat shield is provided to deflect combustion gases away from the boiler walls during periods of low demand for hot water.

The maximum heat exchange surface in such a fireplace corresponds to the internal dimensions of the rear and side walls facing the grate and this is usually more than adequate to fulfill all domestic hot water requirements, particularly when the fire is drawing well in cold weather. However, in warmer weather, when a reasonable flow of combustion products over the walls of the boiler is still necessary to provide domestic hot water, the temperature of the living space neighbouring the fireplace is raised to an uncomfortable extent.

Accordingly, an object of the present invention is provision of a fireplace wherein thermal transfer from burning fuel and combustion products to water in an adjacent boiler or reservoir is enhanced so as, for instance, to enable effective water heating with a low or banked fire i.e. without appreciable flow of combustion products over the walls defining the fireplace.

With this object in view, the present invention provides a domestic fireplace comprising cavity walls which define a boiler or hot water reservoir flanking and backing a grate and a chimney insert disposed above the grate and in front of the backing wall so as to provide a flue therebetween characterised in that the grate is in the form of a number of hollow bars providing channels in communication with the boiler and in that the chimney insert encloses a further water-filled cavity in communication with the boiler.

Advantageously, the fireplace includes a space beneath the grate and a draught control gate which is adjustable to regulate ingress of air beneath the front of the grate.

Preferably to enhance thermal transfer the hot water reservoir flanking and backing the grate and the water-filled cavity within the chimney insert are substantially uniform in width. For the same reason, the cavity walls, the chimney insert and the grate bars are, preferably, all formed of mild steel and have a wall thickness of the order of 1 cm. Moreover, the flue itself may be split to form two constricting diverging passages.

The bars of the fire grate may be disposed parallel to each other and extend transversely of the grate or from front to back. Alternatively, these bars may diverge outwardly from a zone at the front of the grate to the sides and back of the grate.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a first embodiment of the fireplace of the invention;

Fig. 2 is a vertical cross-section of the fireplace of Fig. 1 seated in a hearth;

Fig. 3 is a perspective view from above of the grate of the fireplace shown in Figs. 1 and 2;

Fig. 4 is a vertical cross-section through a second embodiment of the fireplace of the invention installed in a house;

Fig. 5 is a horizontal cross-section through the fireplace of Fig. 4 along the line V-V;

Fig. 6 is a horizontal cross-section through the fireplace of Fig. 4 along the line VI-VI;

Fig. 7 is a horizontal cross-section through the fireplace of Fig. 4 along the line VII-VII;

Fig. 8 is a diagrammatic plan view of a first modification of the grate;

Fig. 9 is a similar view of a second modification of the grate; and

Fig. 10 is a vertical cross-section through a third embodiment of the fireplace of the invention.

As shown in Figs. 1 and 2, one embodiment of the fireplace of the invention comprises cavity walls 10 which define a boiler or hot water reservoir 11 flanking and backing a grate 12. The walls 10 also provide a rear wall 13 and side cheeks 14 facing the space 15 above the grate 12 intended to accommodate a solid fuel fire, which space 15 will hereafter be called "the firebox". A chimney insert 16 extends between the side cheeks 14 above the grate 12 and in front of the rear wall 13 so as to form a flue 17. The insert 16 also encloses a water-filled cavity 18 which communicates with the reservoir 11 in the cavity walls 10.

As shown in Figs. 2 and 3, the grate 12 is in the form of four parallel transverse hollow bars 19 providing water-filled channels 20 which communicate with each other and with the reservoir 11 adjacent the side cheeks 14. Each of the bars 19 is approximately trapezoidal in cross-section with the wider end uppermost. The cavity walls 10, the insert 16 and the grate 12 are all formed of mild steel and have a wall thickness of about 1 cm.

Although not shown in the drawings, controls such as butterfly flaps may be located in the flue 17 to regulate the flow of combustion gases over the walls of the insert 16 and the region of the rear wall 13 which define the flue.

A space 25 is provided beneath the grate 12 when the fireplace is installed in a hearth 21, as shown in Fig. 2. A gap 22 may remain between the base of the fireplace and an ash receptacle 23 so that there is an effective updraught through the fireplace facilitating combustion of solid fuel (not shown) in the firebox 15.

In operation, water from the reservoir 11 circulates through the cavity 16 and the channels 20 in the grate 12. This provides a much more efficient thermal transfer to the water than hitherto, enabling effective water heating with the fire banked down, that is to say without appreciable flow of combustion products over the fire cheeks 14. This enables effective domestic water heating without raising the temperature of the adjacent living space in warm climatic conditions.

Figs. 4 to 7 illustrate a second embodiment of the fireplace of the invention. To avoid repetition of the description, similar reference numerals have been used for parts corresponding to those shown in Figs. 1

to 3. The main difference between this embodiment and the first embodiment is that the hot water reservoir 11 and the cavity 18 within the insert 16 are substantially uniform in width, being, for example, 3.5cm wide throughout. Also the rear portion of the cavity wall 10 is angled at the bottom. Other differences are that the grate 12 consists of only three bars 19, as shown in Fig. 7, and that the flue 17 is split to form two constricting diverging passages 17*a*, 17*b*, as shown in Figs. 5 and 6. All these features enhance the heat transfer between the firebox and the water circulating through the reservoir 11, the cavity 18 and the channels 20.

Also shown in Fig. 4 is an adjustable draught control gate 24 opening into the space 25.

Cold water inlets 28 are provided at the bottom of the reservoir 11 and hot water outlets 29 at the top, for the usual convective heating of the water. However, the connections could be reversed for counter-current flow.

Figs. 8 and 9 illustrate two alternate forms of the grate 12, namely, respectively, one having parallel bars 19 extending from front to rear and one having bars 19 diverging or radiating from a zone at the front of the grate to the rear and sides of the grate, with, in the latter case, the cold water inlet 28 at the middle of the front of the grate 12.

Finally, Fig. 10 shows another embodiment of the fireplace of the invention wherein no space 25 is provided below the grate 12, the bars 19 of which extend from front to back. Instead, air passing through the draught control gate 24 follows approximately the path of arrow A over the bars 19 to the flue 17. This form of fireplace is quite satisfactory where the drawing power of the flue 17 is adequate, for example where the flue 17 ascends through two or more floor levels.

CLAIMS

1. A domestic fireplace comprising cavity walls which define a boiler or hot water reservoir flanking and backing a grate and a chimney insert disposed above the grate and in front of the backing wall so as to provide a flue therebetween, characterised in that the grate is in the form of a number of hollow bars providing channels in communication with the boiler and in that the chimney insert encloses a further water-filled cavity in communication with the boiler.

2. A fireplace as claimed in claim 1 including a space beneath the grate and a draught control gate which is adjustable to regulate ingress of air beneath the front of the grate.

3. A fireplace as claimed in claim 1 or 2 wherein the hot water reservoir flanking and backing the grate and the water-filled cavity within the chimney insert are substantially uniform in width.

4. A fireplace as claimed in claim 1, 2 or 3 wherein the cavity walls, the chimney insert and the grate bars are all formed of mild steel and have a wall thickness of the order of 1 cm.

5. A fireplace as claimed in any preceding claim wherein the bars of the grate are parallel to each other and are either disposed transversely of the grate or extend from front to back of the grate.

6. A fireplace as claimed in any of claims 1 to 4 wherein the bars of the grate diverge outwardly from a zone at the front of the grate to the sides and back of the grate.

7. A fireplace as claimed in any preceding claim wherein the flue is split to form two constricting diverging passages.

8. A fireplace as claimed in any preceding claim including an adjustable heat shield for the cavity walls, which shield serves to regulate flow of combustion gases over said walls.

9. A domestic fireplace substantially as hereinbefore described with reference to and as illustrated in Figs. 1 and 2, or in Figs. 4 to 7, or in Fig. 10 of the accompanying drawings.

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ABSTRACT:

In order to enhance thermal transfer between burning fuel and combustion
products, particularly when the fire is banked low, e.g. in warm weather, water
circulates through cavity walls 10 flanking and backing the fire box 15,
through chimney insert 16, and through hollowgrate bars 19.

Additionally, the cavity walls 10 and chimney insert 16 may be of uniform
width and the flue 17 may be split into two diverging passages (17a, 17b).

The grate bars may alternatively extend from front to rear or may radiate
from a zone at the front to the rear and sides of the grate.
<IMAGE>